Amendments to the Specification

Please replace the second paragraph on page 2 with the following new paragraph:

Generally, a product code is a form of a serial concatenation block turbo code, and shows a high trade-off in a performance and in a complexity ~~comparing~~ compared to a turbo code based on a convolution code. Especially, the product code is less complex and has a higher performance than the turbo code based on the convolution code in a high rate system having a high band-width efficiency and in a short block frame for communication devices.

Please replace the fourth paragraph on page 1bridging page 2 with the following new paragraph:

Figure 1 is a block diagram showing a general digital communication system. As shown therein, the system comprises a source information inputting unit 110 for inputting code information in order to encode source information; ~~a~~ an encoding unit 120 for encoding the source information in order to check and correct an error, which may be generated in the source information, on a communication channel based on the inputted code information; a modulating unit 130 for modulating the encoded source information into a signal transmittable on the communication channel; a demodulating unit 150 for demodulating the modulated signal by receiving a transmitted signal from the communication channel 140; a decoding unit 160 for decoding the demodulated signal into the original source information based on the

code information; and a source information outputting unit 170 for outputting the source information decoded in the decoding unit 160.

Please replace the first paragraph on page 3 with the following new paragraph:

Figure 2 is a structure view showing an RS product code according to the conventional art. As shown therein, Section I designates an information part, and Section II and III designate parity parts. Also, Section IV is a parity part for encoding the Section II or Section III making the parity part into the information part.

Please replace the second paragraph on page 3with the following new paragraph:

In the RS product code, respective row and column vectors are (N, K) codewords, and a respective symbol has a $GF(2^m)$ dimension. Also, the size of an interleaver needed to perform encoding/decoding of the RS product code is K^2. Therefore, the entire depth of a trellis for SISO (Soft In Soft Out) decoding is N, and a respective node of the trellis has 2^m branches.

Please replace the fourth paragraph on page 3with the following new paragraph:

[[First]] A first method is a chase algorithm. However, [[the]] this algorithm has a problem that the decoder becomes very complex because the number of test patterns which is to be produced is very large ~~in case of~~ for the RS code having a large dimension.

Please replace the fifth paragraph on page 3 with the following new paragraph:

~~Second~~ A second method is a SISO decoding method based on a trellis using the MAP (Maximum A posteriori) algorithm, Max-log, SOVA (Soft-Output Viterbi Algorithm) on a trellis of block code.

Please replace the sixth paragraph on page 3 with the following new paragraph:

However, in the above algorithms, the RS code has non-binary characteristics, and the number of branches of a respective trellis node is non-binary. Therefore, the decoding processes of the algorithms in the respective node are more complex than that in the binary branches.

Please replace the last paragraph on page 6 bridging page 7 with the following new paragraph:

Figure 3 is a block diagram showing a digital communication system according to the present invention. As shown therein, the digital communication system comprises: a source information inputting unit 310 inputting code information in order to encode source information; a binary conversion unit 320 for ~~conversing~~ converting non-binary symbols outputted from the source information inputting unit 310 into binary symbols; [[a]] an encoding unit 330 for encoding the source information in order to check and correct errors which may be generated in the source information on a communication channel; a modulating unit 340 for modulating the encoded source information into signals which ~~is~~ are transmittable on

the communication channel; a demodulating unit 360 for receiving the signals from the communication channel and demodulating the modulated signals; a decoding unit 370 for decoding the demodulated signals into the original source information based on the code information; and a source information outputting unit 380 for outputting the source information decoded in the decoding unit 370.

Please replace the first full paragraph on page 7 with the following new paragraph:

The source information inputting unit 310 is inputted with code information such as a code length for the symbols, information length, coefficient of the information polynomial, and coefficient of generator polynomial.

Please replace the second full paragraph on page 8 with the following new paragraph.

Figure 4 is a flow chart showing processes of calculating a binary equivalence generator matrix of the RS code according to the present invention.

Please replace the second paragraph on page 9 with the following new paragraph.

Respective column vectors in the right matrix of Equation (3) are made such that the symbol vectors having symbol B are multiplied by $\alpha^0 \sim \alpha^{m-1}$ in order, after that, binary elements having symbol A are multiplied with the results. That is, a binary equivalence generator matrix for a generator matrix having a certain $GF(2^m)$ symbol is made by multiplying $\alpha^0, \ldots, \alpha^{m-1}$ in order to respective symbols of 'G', and

when the respective symbols of the new matrix are calculated as a binary form as in Equation (1), then it becomes the binary equivalence of the RS code (step SI).

Please replace the third paragraph on page 9 with the following new paragraph.

At that time, the generated binary codeword has the same code characteristics in the original RS code and in symbol weight distribution even if the encoding processes are made at bit level.

Please replace the last paragraph on page 9 bridging page 10 with the following new paragraph.

Therefore, through Equations (1), (2), and (3), the number of [[row]] rows is increased as many as the number of multiplying original row numbers by m, and the binary generator matrix is made by expressing respective symbols constituting the matrix on a polynomial basis. In the binary matrix, the components are 0 or 1 unlike in the original matrix, and the original non-binary matrix is ~~conversed~~ converted into the binary matrix having rows and columns which are m times of the original rows and columns. In addition, the bit level RS code is generated by using the binary matrix (step S2 in Figure 4).

Please replace the first full paragraph on page 10 with the following new paragraph.

At that time, the generated binary codeword has the same code characteristics in the original RS code and in symbol weight distribution even if the encoding processes are made at bit level.

Please replace the second full paragraph on page 10 with the following new paragraph.

Also, as shown in Figure 6, the encoding unit 330 has a similar structure as that of the conventional encoding unit 120, however, the components vectors of the respective rows and columns are made in binary level, and therefore an interleaver of binary level is formed. Therefore, the size of the interleaver is proportional to the square of used binary symbol dimension. For example, ~~in case of~~ for a (N, K) RS code having respective symbols of $GF(2^m)$ dimension, the size of interleaver enlarges to mKxmK from KxK of conventional size (step S3 in Figure 4).

Please replace the third full paragraph on page 10 with the following new paragraph.

Therefore, the size of interleaver is m^2K^2, the entire depth of trellis for SISO decoding of respective vectors is in mN, and the number of branches in a respective node is two.

Please replace the fourth full paragraph on page 8 with the following new paragraph.

Therefore, SISO decoding in a bit level trellis structure can reduce the complexity of branches, ~~the SISO decoding~~ and is useful in a decoder in which branches of a trellis is more complex than the depth of the trellis.

Please replace the fifth full paragraph on page 8 with the following new paragraph.

Figure 7 is an exemplary view showing (7, 5) RS code in $GF(2^3)$. As shown therein, a GF(2) binary generator matrix is made from the non-binary generator

matrix on the left side. Respective non-binary values constituting the left matrix are extended to matrix of 3x3 bit through Equations (2) and (3).

Please replace the second full paragraph on page 11 with the following new paragraph.

That is, the decoding unit 370 generates a binary generator matrix of RS code on being inputted the RS sequence outputted from the demodulating unit 360, and generates a binary trellis using the binary parity check matrix corresponding to the binary generator matrix of the RS code.